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ABSTRACT

This paper discusses the management information needs of state governing boards and higher educational institutions in their efforts to develop and implement management information systems designed to improve institutional accountability. Based on a literature review, the paper describes the need and the experiences that state governing boards and higher educational institutions have had in the treatment of data and information. Information-related problems which negatively affect the effectiveness of statewide management information systems are given primary attention: management information illiteracy, organizational discontinuity, computer illiteracy, and financial limitations. Solutions are offered for information-related problems affecting three elements of the statewide management information system: data identification and collection; data analysis and use; and data linkages of information systems. Recommendations are proposed for improving the development and implementation of statewide information systems. (Author/THC)

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INFORMATION-RELATED PROBLEMS OF STATEWIDE MANAGEMENT INFORMATION SYSTEMS

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ABSTRACT

This paper discusses the management information needs of state governing boards and higher educational institutions in their efforts to develop and implement management information systems designed to improve institutional accountability. Information--related problems which negatively affect the effectiveness of statewide management information systems are given primary attention in the article. Also, solutions to these information-related problems which affect three important elements of the statewide management information system: data identification and collection, data analysis and use, and data linkages of information systems, are discussed. Recommendations are proposed, in the conclusion of the paper, for improving the development of statewide management information systems.

Introduction

The need for timely, accurate, and relevant information and its effective utilization in managing multi-institutional systems is essential. This point is especially true with regard to state governing boards and higher educational institutions for two of many reasons: first, to effect intra-institutional decision-making for the efficient use of resources, i.e. funding, personnel, operational units, etc.; secondly, to facilitate inter-institutional cooperation in defining, planning, and achieving institutional accountability goals.

The paper provides a literature review which describes a) the need and b) the experiences that state governing boards and higher educational institutions have had in the treatment of data and information. Three information-related problem areas are identifiec and discussed: data identification and collection, data analysis and application, and data linkage of information systems. The paper describes how these information-related problems affect state governing boards. Suggestions for improving the actions of state governing boards in these information-related problem areas are also provided. The conclusion of the paper summarizes planning considerations that state governing boards should take into account in their efforts to develop a statewide management information system (SMIS) as a means to achieve institutional accountability. The final recommendation is to generate a statewide coordination plan cooperatively as a prerequisite to the design of a statewide management information system (SMIS).

Institutional Accountability - The Need

Any effort to understand how state governing boards can improve the institutional accountability of higher educational institutions must begin with a definition of institutional accountability. This concept, as used here, refers to the management responsibility of a publicly-sanctioned institution to demonstrate to its external support systems two interrelated points: first, the institution's ability to be 'commensurately productive and efficient' with publicly allocated resources; second, the ability of the institution to achieve its mission and goals, in a manner consistent with terms and expectations.

Before the 1950s the early 1970s higher educational institutions experienced growth and expansion. State governing boards, according to Berdahl (1971), were in their early stages of development. Institutional accountability was not a major factor for state legislators.

The current decline in the growth and expansion of higher education is caused by many external events beyond the control of higher educational institutions, e.g. college enrollment decline, and limited state funding (Cheit, 1975; Millard, 1977; and the ECS, 1980). State governing boards, concurrent with the decline of higher educational growth and expansion, have been given greater state legislative support to achieve statewide coordination through planning. Legislative support has been provided to strengthen the control of state governing boards over state systems, of higher education (Berdahl, 1971).

Since the early 1970s those institutions which are part of state systems of higher education have sought to individually resolve the problems brought on by the decline in educational growth. Generally, they have limited or expanded academic program development to marketable degree programs.

Dressel (1980), charges that state legislators have concluded "that the actions taken by higher educational institutions have resulted in academic program duplication, overlapping, and competition." In addition to this he asserts that this view has resulted in the demand for increased institutional accountability sought through statewide coordination (Dressel, 1980, pp. 36-40).

A methodological description of statewide coordination as a planning process to achieve institutional accountability does not represent a task of this paper. Also, whether state legislators and state governing borads are correct or not in their assumptions that higher educational institutions should be governed more closely by state boards is not considered in this paper. What is considered and analyzed are the information-related problem areas which negatively affect the efforts of state governing borads to develop and implement statewide coordinating plans to attain institutional accountability for state systems of higher education. Suggestions for state governing boards to improve their information management are provided. A review of current literature and case studies are discussed

in relation to these two points.

Data Identification and Collection

The first information-related problem area which affects the achievement of institutional accountability through statewide coordination is data identification and collection. These problems represents a lack of clarity and consensus between state governing boards and higher educational institutions over one or more of the following:

(1) the purpose and use of the data to be collected,

(2) the type and depth of data to be collected,

(3) the cost of collecting data,

(4) the time for collecting data,

(5) the sources from which to collect the data,

(6) the method of identifying and collecting the data.

One of the central reasons for these information problems, according to Jones (1982), is the lack of a coherent conceptual foundation to guide the development of systems for collecting and storing data and coverting them into useful information..."(p.5). In particular there is disagreement between the state governing boards and the individual institutions on the appropriate framework for data collection.

Adams (1977a, pp. 81-83) provides a synthesis expert opinion on the reasons for the difficulties in meeting the information needs of state governing boards and higher educa-

tion administrators. A list of these explanations is presented below:

(1) A reluctance on the part of management systems analysts to remain neutral in the presentation of data to decision-makers.

(2) Incompatible structure for collecting information to support decisions.

(3) The inadequacy of the basic input/output analysis model in light of our inability to measure adequately the outcomes of higher education.

(4) The failure of most analytical systems to synchronize the timing of output delivery to the requirements of the decision process.

(5) The over-reliance of most analytical systems [for identifying data] on files developed for operational systems [without regard for data from other vital institutional units, i.e. management program, etc.].

(6) The relatively low level of expertise of top administrators regarding the analytical techniques used in higher education to specify information or data requirements.

Impact

The impact of the information-related problem of data identification and collection affects the use of statewide coordination for achieving institutional accountability in several ways. The quality and exchange relationship between state governing boards and higher educational institutions is negatively affected. Hollander (1975), points out that "collecting data without knowing why is a major danger which disrupts the relationships between state agencies, promotes suspicion and mistrust, and affects the quality of data submitted and its efficient use for purpose of statewide planning" (pp. 3-4).

Another major impact is the perceived loss of autonomy by its individual institutions. As state governing boards unilaterally define the need for information and select specific data to be collected, higher educational institutions experience a "direct loss of institutional autonomy" (Hines and Hartmark, 1980, p. 19). Such higher educational institutions, according to Huff (1975, p. 17) may become limited in their ability to develop more efficient academic programs.

The development of efficient academic programs is aided by institutional research that helps to identify, collect and facilitate the analysis of data for the benefit of institutions and state governing boards. Ford and Stevens (1983, pp. 3-6) claims that institutional research, directed at academic program development, lacks effectiveness for two reasons. These involve (1) data inconsistency among various databases and (2) variant definitions for the data elements. In those cases where institutional research evidences these problems, Jones (1982) asserts that the quality of the collected data used in the research findings becomes unreliable due to questions on its "validity, accuracy, and reliability - all of which are properties of measurement" (pp. 12-15). He further adds that the information derived from the use of such data is limited because of problems of "timeliness, accuracy, completeness, relevance, and acceptability" (pp. 23-26).

Resolution

Efforts to resolve information-related problems in data identification and collection were heavily emphasized during the mid-1970s, a period which highlighted the growth of governing boards. Various efforts to resolve the problems were recommended. Chief among the solutions suggested was the development of a conceptual foundation for a management information system mutually conceived by state governing boards and higher educational institutions (Hemminger, 1975, p. 126; Cloud, 1979; and Jones, 1982). Jones asserts that the exchange of ideas and the identification of data to be collected can not effectively be achieved "unless they share a conception of purpose and understanding of available capabilities and limits" (pp. 47-48) of the management information systems.

Following, the development of a mutually conceived conceptual foundation for the management information system proposed for statewide coordination objectives, a second solution to the information-related problems of data identification and collection was emphasized. It involved the need to coordinate, structure, and organize mutually the identification and collection of data. Jones' (1982) approach to development a management information system relative to resolving such information-related problems emphasized that the MIS should;

1. "define data and information along with their components, properties, and identification of issues which surround their use,
and
2. be designed separately for operational systems and decision-support system, they should be interdependent (not integrated), and supported by a multiple data base system" (pp. 45-50).

Wing, et al., (1975); and Caruthers, et al. (July, 1977) have described management information system which emphasize statewide measures inventories. Some of these management information systems are as follows:

1970 - Standardized Conventions for Organizing Data for Academic Planning and Analysis.

1970 - HEGIS Discipline Taxonomy.

1970 - Institutional Functioning Inventory.

1970 - Institutional Goals Inventory.

1972 - The Program Classification Structure (PCS), developed by NCHEMS.

1972 - The Higher Education Facilities and Inventory Classification Manual.

1974 - Joint Accounting Group Report.

1975 - A Manual for Budgeting and Accounting for Manpower Resources in Postsecondary Education.

and

1975 - State-Level Information Base (SLIB).

The HEGIS and SLIB were two of the most popular management information systems designed in the 1970s and early 1980s to resolve the information-related problems of data

identification and collection. Brinkman and Krakower (1983, p. 32) report that HEGIS has been used for financial data comparisons involving faculty salaries, revenues and expenditures, enrollment data, and degree-awarded data.

The State-Level Information Base (SLIB) was initiated in 1975 to assist state-level planners in postsecondary education with their information needs (Bassett, 1979a). More specifically, the purposes of SLIB were to:

- "synthesize a set of planning issues that the states have in common and to develop a reference framework within which specific analytical requirements and associated information needs can be determined
- encourage the definition and analysis of the decision-making requirements associated with common postsecondary education issues as the basis for each state's individual data collecion decisions,
- emphasize the need for institutional involvement and consideration of institutional capabilities to provide data,
- encourage evaluation of current data collection activities, emphasizing selectivity and adaptation of existing data bases in satisfying new data needs,
- note the variety of circumstances that affect the costs of developing a state-level information system,

and

- promote exchange of profile information among interested states, after specific issues have been identified and specialized definitions and procedures have been developed" (p. 3).

Five documents were published as a result of the SLIB project under the general title of Postsecondary-Education Information Planning at the State Level. The individual titles were (1) An Overview, (2) Planning Guide, (3) Selection of Data to Address Planning Issues, (4) Pilot-test State Case Studies, and (5) Systems-related Experiences in Eight Pilot-test States.

Bassett (1979a, pp. 14-16) states that as a result of the pilot-studies on the application of SLIB, state governing boards should consider three important points in the state-institutional interface for data collection. First, it is important that a state agency (governing board) be selective in the process of identifying data items and avoid the collection too much irrelevant data. Second, state agencies should cite the specific resource for collecting each data item. Third, the state agency should consider institutional resource capabilities, both short-term and long-term, when asking higher educational institutions to provide data. Hollander (1975, p. 5) and Huff (1975, pp. 1-7) expressed similar points.

Additional Recommendations

In addition to the adoption of the above solutions to resolve problems in data identification and collection, other corrective steps should be considered. State governing

boards should encourage state legislators to concur and assist in efforts to identify data that the state might use in its budgeting decisions on the funding of higher education. State governing boards should also emphasize to the state legislation the cost of collecting certain kinds of data.

State Governing boards should also consider and act on the need of higher educational administrators to clarify data identification and collection from the top level of administration down to the smallest organizational unit. Concern should be focused on assuring that each organizational unit immediately affected by the request for data, can have direct input in the institutional efforts to identify, collect, and provide data to the state governing board.

Data Analysis and Use

The second information-related problem area which affects efforts to achieve institutional accountability through statewide coordination is data analysis and use. This problem may be described as the inconsistent and inappropriate use of analytical techniques, models, and processes for interpreting, analyzing, and converting data into useful, timely, and accurate information. Issues of the misapplication of the data which affects the decision-making processes of the state governing boards and higher educational institutions are related to information problems in data analysis

and use. An explication of these information-related problems are discussed in the following section.

Explication

Baldridge and Tierney (1979, pp. 14-17) report disagreements about the applicability of management information systems and procedures for analyzing data in higher education. The primary issues between administrators in higher educational institutions and state governing boards have focused on the:

(1) disagreement on the definition and measurement of education outputs,

(2) lack of accepted formulas for determining the resources required to produce a unit of output,

(3) disagreements on the centralization and decentralization of data for purposes of analysis and use,

(4) preferential use of MIS for administrative efficiency and academic effectiveness,

and

(5) quantification of subjective concepts or qualitative data (pp. 14-17).

Adams (1977) addresses the lack of suitability of analytical models used in higher education for the treatment of and models used in higher education for the treatment of data. Brinkman and Krakower (1983) add to the discussion of information-related problems in data analysis and use. They contend that state governing boards and higher educational institutions' use of comparative data, not as supplementary information, but "as the core of consideration" represents another example of an information-related problem connected

with data analysis and use. The use of comparative data as the core of consideration for institutional decision-making by state governing boards, according to Brinkman and Krakower (1983) could reflect "narrowness, misrepresentation, sameness, and misperception" in decisions and policies.

Every state governing board has the centralized responsibility to analyze the information it collects to ensure the achievement of its statewide coordination goals for institutional accountability. Huff (1975, pp. 4-6), however, would argue that such boards and higher educational institutions could and do "profitably" misuse or inappropriately analyze in four ways. First, they display only those pieces of data that are helpful in supporting their preconceived positions or the expectations of external support groups. Second, they aggregate data elements using decision rules or analytical techniques that maximize some comparative figures and minimize others. Third, they use comparative data from several campuses in rank order. They then imply in their analysis of the data that the relative positions on the list indicate the institution's relative value or quality of its performance. McCoy (1982) and Ryland (1982) make this point about the misuse of the HEGIS financial data.* Fourth, they use historical statistics as a basis for future planning and budgeting decisions.

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*Refer to Brinkman and Krakower (1983, pp. 6-10) for further discussion on the misuse of comparative data analysis.

Donmoyer (1984) contributes to our efforts to understand the information-related problems of data analysis and use. In presenting his research findings to the 68th Annual meeting of the American Educational Research Association, he alleged that "disputes among users of data for decision-making differ in their interpretation of qualitative data for three reasons: their research orientation or perspective; purpose of data analysis; and different frames of references for studying the problem."

A discussion of the impact that these information-related problems of data analysis and use have on the efforts of state governing boards to achieve institutional accountability is discussed below.

Impact

State governing boards must provide opportunities to their constituent institutions to perform in accordance with two requirements a) innovative and spontaneous behavior, and b) objectively measured behavior based on recognized and accepted standards of performance. Katz and Kahn (1978, pp. 402-405) would agree that the availability and fulfillment of these two behavioral requirements are essential if the institutions are to survive and function in a cooperative capacity with their external environment - especially with their state governing boards. Baldridge (1983) adds that an institution's a) level of bureaucracy and autonomy, and b) pressures from the external environ-

ment affect its climate. The institutional climate affects the quality of the institution's organizational performance; the acceptance and interpretation of data; and the [cooperative] relationships of its campus leadership to its external environment or state governing board (Millet, 1981, pp. 502-506).

Unfortunately, in some cases the information-related problems of data analysis and use negatively impact on the efforts of state governing boards to establish and maintain a favorable institutional climate within institutions and the entire state system of higher education. As a consequence, planning for statewide coordination to achieve institutional accountability has been affected by four interrelated problems. First, there has developed, according to Huff (1975, p. 8), an adversarial relationship between state governing boards and their constituent institutions. He claims that this situation has resulted from differences in opinion on the use and analysis of data, the selection of planning objectives based on such data, and the statewide governing processes. Second, Huff reports mistrust between state governing boards and institutions as evidenced by the manipulation of requested and received data in order to control the statewide planning process.

Third, there exists, according to Balderston (1974, pp. 237-239), the problem of organizational stress between state governing boards and institutions. This view is shared by Millard (1981) and Dressel (1980). Balderston claims that organizational stress has resulted from the use of data by

state governing boards involving questions of reporting, measuring, and evaluating institutional performance. Also, he claims that the problem exists because of a question on whether data can be used properly to make distinctions between external and internal institutional operations another problem relates to the control over data systems and statistics they produce.

Fourth, Caruthers, et al. (1978 , p. 8) report the existence of another problem, unilateral changes in informational approaches to decision-making within the statewide planning process. Such a situation serves to create indecisiveness and lack of comprehension among institutions in their commitment and constructive contribution to the planning process for improved institutional accountability. Caruthers, et al. claim that this problem is a result not only of change in state-level academic planning, but also becauee of change in the information technology for data analysis and computation.

A general description of several approaches to resolve the information-related problems of data analysis and use are discussed below.

Resolution

Four of the basic approaches used to resulve these information-related problems. First, the development of a mutually conceived conceptual framework for the integration

of data (its analysis and use) within the statewide planning process. Second, the development of specialized data analysis techniques related to select types of institutions. The other two involve the prevention of information and data misuse; and the prevention of misleading use of comparative data for analysis and accessibility, respectively.

Relative to the first approach, Bassett (1979b, pp. 6-8) proposed a ten step information-planning sequence. He stressed that state governing boards, in cooperation with their constituent institutions should work towards:

1. defining the operational funding, and management issues which affect data analysis and use in the statewide coordination planning process.
2. describing the decisions to be made on issues identified in step 1.
3. describing the intended analytical approaches (or alternative approaches) through which decisions will be addressed;
4. describing the data and information required to implement the selected analytical approaches;
5. distinguishing between recurring and one-time data requirements;
6. determining the necessary level of data agreegation for select purposes of analysis;
7. distinguishing between data available in the existing data base and data to be incorporated into new data-collection activities;
8. listing the data elements requiring new collections of specified and clarified data requests;
9. identifying sources from which to collect the new data elements

and

10. defining the new data elements in order to define and select the proper analytical approach.

Balderston (1971, p. 112) in support of Bassett claims that:

> "statewide planning is enhanced when planners give consideration for fairness in the derivation of conclusions from analysis, rigorous expertise, a willingness to spend not only a great deal of efrort in collecting information but in disseminating it for the use and benefit of the constituent institutions. Also, to allow institutions participation in the formation of decisions as well as enable them to be very clear about the basis for the decision when it is made, and use of expertise from the institutions potentially affected by decisions of the statewide planning agency."

The second approach, involving the development of specialized analytical techniques was emphasized by the Education Commission of the State's Task Force on Accountability (1979, p. 11). The Education Commission of the States (ECS) report on accountability suggested an accountability process for developing analytical techniques and measures for "assessing each institution's [or similar types of institutions] achievement of its own goals and objectives." Caruthers, et al. (1977) proposes that state governing boards consider developing three basic types of analytical techniques related to costing, simulation, and optimization. State governing boards should identify the limitations and advantages of each type of analytical technique relative to specific data analysis needs of both the board and its constituent institutions.

Huff (1975, pp. 23-24) responds to the third approach, the prevention of the misuse of information and data. He proposes that state governing boards develop and implement three sequential tasks to avert the dangers of the misuse of information and data:

1. establishment of a complete delineation of the prerogatives and areas of autonomy attached to each level of educational management, as developed by the statewide agency and reviewed periodically,

2. development of a clear statement in defining the sequence of events within the planning and budgeting processes,

and

3. development of the specifications for a statewide data base and management information system.

Brinkman and Krakower (1983, p. 34) respond to the fourth approach, the prevention of misleading comparative data analysis. They emphasize the need for state governing boards to develop and implement three pre-conditions to ensure the effective analysis of comparative data by

- providing that the products and services generated by the institutions in the analysis are fully known to institutions using the data,

- providing that all institutions in the analysis use similar data recording and analytical, techniques

and

- providing any data or information relevant to any environmental differences which affect the institutions used in the comparison.

Also, Brinkman and Krakower (1983, pp. 43-61) and Ryland (1982) suggest that state governing boards use peer groups from like institutions to identify comparative data guidelines and requirements, analytical techniques and procedures, and institutional characteristics.

Data Linkages of Information Systems

The third information-related problem area, which affects efforts to achieve institutional accountability through statewide coordination is data linkages of information systems. This area is described as the problematic existence of gaps and distortions in the integration, distribution, and exchange of data and information within and between institutions.

It is the opinion of this writer that the level of efficiency which state governing boards can attain is dependent on their ability to manage effectively the linkage of data between information systems. The basic contention of this belief is that for data to be effectively maximized for planning, it must be organized (Hemminger, 1975, pp. 131-132).

Herzlinger (1977, pp. 81-86) makes the statement that "non-profit organizations do not lack data... rather they lack systematically provided information to help management do its job." Relative to the emphasis placed on the need for state governing boards and their constituent institutions to develop a collectively conceived conceptual foundation for planning and implementing a MIS, Jones (1982, p. 5) provides an interesting observation. He contends that higher education lacks "the needed conceptual foundation not because the component parts [databases] are unavailable, but rather

because available knowledge [data and information] has not been properly integrated." Bryson (1978) adds that "the expectations of statewide higher education MIS's were that they would meet the needs of various levels of management, i.e., institutions, governing boards, the state legislature, governor, as well as federal and various non-government entities." The linkage of the information systems between these entitles, he claims, has failed to allow statewide data collection systems or MIS's that developed in the late sixties to serve "as the vehicle for achieving greater efficiency and accountability in higher education." An explication of the information-related problems in the data linkage of information systems is discussed below.

Explication

For purposes of clarification, information-related problems which affect data linkages of information systems are classified in this paper as follows: (1) management information illiteracy, (2) organizational discontinuity, (3) computer illiteracy, and (4) financial limitations.

Management information illiteracy is a term ascribed to administrators who lack the knowledge, understanding of how to collect, exchange, distribute, and integrate data between information systems. Consequently, problems develop in establishing and promoting confidentiality and trust, or in fostering cooperative relationships between solicitors, suppliers, and users of data and information systems.

Adams (1977) contributes to this idea by suggesting that "the judgement required [by higher education administrators] to balance the information needs of users with concerns over confidentiality creates problems of linking information systems." Brinkman and Krakower (1983, pp. 3-5) state that administrators are faced with internal and external "demands for accountability." Such demands exceed, in many cases, the administrators' knowledge and ability for requesting and managing data for linking information systems. Wilson (1978, p. 5) agrees with this and adds that due to these administrators' lack of timeliness in addressing internal and external demands for accountability, the data that is eventually collected does not prove timely and accurate. Neither will such data allow continuity in the data links between the information systems.

Organizational discontinuity describes the existence of disparate and unconnected information systems within and between institutions. Schroeder and Adams (1976) note that "it is important to consider these great differences in institutional organization because the success or failure of any MIS rests upon its own capacity to adapt to the needs of pre-existing decision-making processes." This point of view is shared by Bryson and Smith (1978). They believe that failure of any statewide MIS on the operations of the participant institutions is determined by the inconsistent organizational and decision-making structure of various postsecondary institutions in the state sytem.

Lawrence (1977) belives that decision-making processes rely on information from three systems: a) the operational system, b) the management system, and c) the planning system. He contends that the failure to link these information systems to decision making processes is due to three inappropriate administrative actions -- the centralization of authority whenever information is centrally collected and analyzed, the attachment of greater importance to quantitative rather than qualitative measures, and the over-emphasis of computer approaches to problem-solving. He claims that these administrative actions are made contrary to understanding the current status of the institution's degree and form of organizational discontinuity which affects the collecting, defining, and reporting of data.

Computer illiteracy describes a situation where administrators of state governing boards and higher educational institutions who lack proper training, knowledge, and experience in using computer technology as a resource for information management. The voluminous amount of requested data and information in response to intra- and inter-institutional demands require the use of computers to manage, store, and compute such data.

According to Drummond (1983, pp. 1-3) the lack of computer literacy among top level managers has contributed to "fragmented, segregated, and generally unavailable and under utilized data. He claims such conditions result in problems of timeliness,

accuracy, and relevance of data which affect data linkages of information systems. Adams et al. (1976) and Bryson (1978) argue that the lack of computer literacy among higher educational administrators contributes to their inability to develop a systematic rationale or conceptual framework required to link data between information systems.

Financial limitations are described as the lack of adequate funding or the unwillingness to invest in the purchase of updating of computer systems, software, and facilities. It may also refer to the institution's financial inability or reluctance to employ computer and information management personnel. Drummond (1983) contends that colleges and universities are hampered by the limitations of capital expenditures, which makes it almost impossible to discard existing computing facilities in favor of installing a fully integrated micro to mainframe system. Such problems limit the institution's ability to link data among information systems effectively.

It is important to note, that while computers are useful in establishing MIS (Baldridge and Tierney, 1979, p. 13), their centralized control combined with their unsystematic application throughout the organization can "subvert the efficiency of the lower management functions" essential to achieving institutional accountability (Bryson, 1978). Non-computerized sources, such as faculty and administrative networks within and between institutions, should be systematically integrated with computers and other elements which comprise the statewide MIS (NCHEMS, 1978).

Case examples are discussed below which describe the impact that information-related problems from data linkage of information systems have on institutional goals to achieve institutional accountability. Organizational discontinuity will serve as the main focus of this discussion.

Impact

Three case examples involving the University of Missouri, the University of Nevada at Reno, and the California State Postsecondary Education Commission are discussed. They illustrate how information-related problems of data linkage of information systems affect goals directed at institutional accountability. Particular emphasis is placed on organizational discontinuity because of the writer's belief that this problem is attributable to the other three problems.

Rokicki and Springer (1983) discussed the University of Missouri's plan to link student and administrative databases together to better control student services and academic planning - both tasks designed to improve institutional accountability. He reported that the university was unable to achieve its goal due to the existence of many information-related problems involving organizational discontinuity. Chief among these were redundancy and duplication of data between the databases from admissions, academic departments, schools, and other organizational units throughout the university. Each unit had its own methods of collecting, defining, classifying, and analyzing data on students. As a

consequence, the central administrative office experienced difficulties in collecting timely, accurate, and relevant data need for both internal and external purposes related to academic planning.

The MIS Task Force (1983) identified three goals for the University of Nevada at Reno:

1. to respond objectively, quickly, and clearly to requests for information and demands for accountability;
2. to provide an accurate evaluation of institutional processes, programs, and goals;

and

3. to improve institutionwide coordination, cooperation, and planning.

Efforts to achieve these goals were limited due to many information-related problems involving organizational discontinuity in the linkage of data between information systems. To a great extent, data requested from organizational units was not a) presented in a usable format, b) accessible to the extent demanded, c) transferable for central administrative and planning operations, d) timely, and e) consistent with the use of similar databases and information systems. Other such problems as the data collecting and programming cost were expensive to the point of discouraging administrators from investing time and resources in an attempt to link data between information systems.

In response to a request from the California State legislature, the California State Postsecondary Education Commission (1980) proposed a plan to obtain information on

the number of community college students eligible to transfer to the University of California and California State University. The CSPEC was not able to achieve its goal due to information-related problems similar to those discussed above. Each of the university systems used different eligibility requirements for classifying and accepting freshmen and transfer students. As a result the data requested and received by the CSPEC proved difficult and in most cases impossible to aggregate the data meaningfully among information systems. Consequently, the CSPEC was not able to provide appropriate data in its institutional accountability report to the California State legislature.

Efforts to resolve these types of information-related problems have taken many paths. The following section of this paper discusses several approaches.

Resolution

Three case examples are discussed: the University of Missouri, Columbia University, and the Medical University of South Carolina. They each describe a different approach: transactional systems, centralized computer networks, and information resource management units. Most importantly they demonstrate how each approach can be used to resolve unique conditions of organizational discontinuity within and between institutions which affect data linkage of information systems.

The first approach involves the use of transactional systems. Its intent is for all participating organizational

units of an institution or institutions of a statewide system of higher education to establish a set of procedures collectively for use in identifying, collecting, computing, and linking data between information systems. Information systems developed by this approach are designed to operate both manually and with computer support.

The University of Missouri case (Ford and Stevens, 1983) illustrates the transactional system approach. It was used primarily to resolve information-related problems of organizational discontinuity. The various academic departments, schools, and other organizational units were contacted systematically and included within the institution's decision-making to establish and implement an institutionwide information system. This approach enabled data to be provided in the hands of users, with all users working from a commonly defined data base.

The second approach involves the use of a centralized computer network with a systematic distribution and use of terminals and mini-computers within and between institutions. The centralized network allows the information systems within smaller organizational units to be linked to a centralized computer center or mainframe.

In the case of Columbia University (Juckiewicz and Kroculick, 1984) the institution had an inconsistent and fragmented information system. Information was untimely, inadequate, and not relevant to the university's data and

information needs. The university developed a distributed administrative management information system (DAMIS) based on the centralized computer network approach. The DAMIS linked every department and school to a central administrative computer. Due to this approach users acquired direct access and the capability to enter, track, control, and report administrative information relative to their special data and information needs (Juckiewicz and Kroculick, 1984, pp. 10-13).

The third approach involves the use of information resource management units or a centralized office. The purpose is to monitor, evaluate, and plan for the linkage of diverse management information systems used within and between institutions. This approach was described by Smith and Groves (1984). They developed an MIS referred to as a DIRM: Department of Information Resource Management. Department Personnel were to work with and provide technical assistance to administrative staff of organizational units within the Medical University of South Carolina in the identification, classification, collection, access, and reporting of data and information. This approach primarily, succeeded in allowing the university to link the data of diverse information systems and to identify and implement organizational changes to help improve the accurate, timely relevant use of data and information within the university.

The following conclusion of this paper provides a summary of the main points discussed in this paper. Also, it provides

a recommendation that defines the planning principles which state governing boards should consider in the development of a watewide coordination plan used to attain institutional accountability.

Conclusion

State governing boards have received pressure and legislative support to achieve institutional accountability within and between institutions that comprise the state systems of higher education. Statewide coordination by state governing boards represents a major planning strategy in the development of state plans (referred to as statewide coordination plans) for higher education.

The unsystematic development and application of management information systems (MISs) within and between institutions, separate from the development and implementation of statewide coordination plans, have limited the effectiveness of such plans in the achievement of goals for institutional accountability. Three information-related problems -- data identification and collection, data analysis and use, and data linkage of information systems attributable to the unsystematic development and application of MISs -- partly explains the limited effectiveness of statewide coordination plans. Collectively these information-related problems negatively affect the timely, accurate, and usefulness of data for planning purposes within and between institutions. Invariably, admini-

strative decision-making processes of institution and state governing boards have become ineffective and inefficient in the achievement of goals for institutional accountability.

A corrective approach to limit the negative impact of information-related problems requires that state governing boards develop a statewide coordination plan which includes the systematic integration of a statewide management information system (SMIS). Under the leadership of the chief executive officers of state governing boards such statewide coordination plans should be developed with the aid of constitutent institutions (Bassett, 1979a; and Katchian, 1979). Planning and information needs must be mutually identified by state governing boards and instituions.

Attainment of a collectively developed statewide coordination plan discussed above is possible if the state governing boards can develop a planning process that considers planning management and information management.

Under planning management, five points should be considered.

(a) It is both valuable and necessary for CEOs to provide guidance and leadership, at the institutional level in the development and implementation of an SMIS within the statewide coordination plan;

(b) The SMIS must be integrated into the decision-making processes at both the state and local levels (Bryson, 1978; and Bassett, 1979 a&b);

(c) There must be recognition of the limitations of requested data and information, and data analytical techniques in answering certain questions or measuring institutional accountability;

(d) There must be recognition of the advantages of information systems (computer and non-computer) for improving administrative decision-making processes within and between institutions (Bailey, 1982, pp. 36-40);

(e) There must be recognition of the advantages and limitations of inter-institutional cooperation in the pursuit of statewide coordination goals (Miller, 1985);

and

Five points should also be considered under information management:

(a) There must be recognition of the present and future information needs of major types of i) users: instructional, and planning (McLaughlin, et al., 1978; McMams, 1978; and Bassett, 1979); and ii) institutions, facilitated through the use of classification schemes for organizations (Hendrick and Bartkovich, 1984);

(b) There must be consideration given to the organizational, environmental, and procedural requirements and conditions which govern the operations of the SMIS (Wattel, 1975; and Bassett, 1979a);

(c) There must be recognition and analysis of the impact of strategies and approaches to resolve information-related problems in one area, i.e. data identification and collection, on those selected for another area;

(d) There must be consideration given to the reliability of data and its easy and timely access within and between institutions (Ford and Stevens, 1983, p. 5);

(e) It is essential to consider the cost factor to both the state governing board and institutions in collecting, reporting, computing, and storing of data and information (Hemminger, 1975; and Bryson, 1978).

Finally, the uniqueness of the administrative powers and responsibilities of state governing boards plus the organiza-

tional climate and structure of the state system of higher education should also be considered in the planning process. Only then can state governing boards and their constituent institutions responsibly undertake actions to achieve the goals of institutional accountability.

REFERENCES

Adams, Carl R., ed. Appraising Information Needs of Decision Makers. New Directions for Institutional Research Series, No. 15, San Francisco: Jossey-Bass, 1977.

Adams, C. R., Kellogg, T. E., and Schroeder, R. G., "Decision-making and Information Systems in Colleges: An Exploratory Study." Journal of Higher Education, 1976, 47(1), 33-49.

Bailey, Robert L. Information Systems and Technological Decisions: A Guide for Nontechnical Administrators. AAHE-ERIC/Higher Education Research Report No. 8, 1982. Washington, D.C.: American Association for Higher Education, 1982, pp. 36-40.

Balderston, Frederick E., "Statewide Planning and the Individual Institution's Response." (ed) Lyman A. Glenny and George B. Weathersby. Statewide Planning for Postsecondary Education: Issues and Design. A publication prepared by The National Center for Higher Education Management Systems (Boulder, Colo., September 1971). p. 112.

Balderston, Frederick E. Managing Today's University. San Francisco: Jossey-Bass, 1974. pp. 237-239.

Baldridge, J. Victor and Tierney, Michael L., New Approaches to Management: Creating Practical Systems of Management Information and Management by Objectives. San Francisco: Jossey-Bass, 1979, pp. 14-17.

Baldridge, J. Victor, et al., Policy Making and Effective Leadership. San Francisco, CA.: Jossey-Bass, 1983.

Bassett, Roger. Overview. Postsecondary-Education Information Planning at the State Level: Volume 1, Boulder, Colo.: National Center for Higher Education Management Systems, 1979a.

Bassett, Roger. Planning Guide. Postsecondary Education Information at the State Level: Volume 2. Boulder, Colo.: NCHEMS, 1979b.

Berdahl, Robert O. Statewide Coordination of Higher Education, Washington, D.C.: American Council of Education, 1971.

Bryson, Charles. Are Statewide Data Systems Meeting the Local Institution's Needs? AIR Forum Paper 1978. A paper presented at the annual Association for Institutional Research Forum (18th, Houston, Texas, May 21-25, 1978).

Bryson, C. H. and Smith, G., Data Flow in a Statewide Higher Education Management System: The need for a two way street. In Computer Technology: The Educational Catalyst, Proceedings of the 16th Annual Convention of the Association for Educational Data Systems, Atlanta, GA, 1978, 13-17.

Brinkman, Paul; Krakower, Jack, Comparative Data for Administrators in Higher Education. An NCHEMS Executive Overview. Boulder, Colo.: Higher Education Management Systems, 1983. p. 3.

California State Postsecondary Education Commission. Plan for obtaining College Transfer Student Information, Sacremento, CA: CSPEC, 1980.

Caruthers, J. Kent. Orwin, Melvin D. Analytical and Informational Support for State Level-Academic Planning. A paper presented to seminar on academic affairs for state-level officers sponsored by the Education Commission of the State's Inservice Education Programs. NCHEMS Boulder, Colo. (July 1977).

Cheit, Earl F., "The Next Decade in Higher Education: Obvious Problems and possible Solutions." A paper presented at a Seminar for State Leaders in Postsecondary Education (Hartford, CT, November 1975), sponsored by the Education Commission of the States, 1975. pp. 7-8.

Cloud, Sherrill. Selection of Data to Address Planning Issues. In: Postsecondary-Education Information Planning at the State Level: Volume 3, Boulder, Colorado: NCHEMS, 1979.

Diamond, Arnold L; et al., Decision Support: The End-User Finally Gets What He Wants. In: Information Resources and the Individual. Proceedings of the CAUSE National Conference (San Francisco, CA, December 11-14, 1983). Boulder, Colo.: CAUSE, 1984, p.

Donmoyer, Robert, Choosing from Plausible Alternatives in Interpreting Data. A paper presented at the Annual Meeting of the American Educational Research Association (AERA) (68th, New Orleans, LA, April 23-27, 1984).

Dressel, Paul L. (ed.) "The Autonomy of Public Colleges." New Directions for Institutional Research. No. 26, 1980.

Drummond, Marshall Edward. "Academic Information Management--A New Synthesis." A paper presented at the Proceedings of the CAUSE National Conference (San Francisco, CA, December 11-14, 1983). Boulder, Colo, CAUSE, 1984, pp. 177-186.

Education Commission of the State's Task Force on Accountability. Accountability and Academic. Denver, Colo: Education Commission of the States, 1979.

Education Commission of the States' Challenge: Coordination and Governance in the 80's. A report on Issues and Directions in Statewide Coordination and Governance of Postsecondary Education in the 1980s, Report No. 134, July 1980, pp. 10-

ECS. Challenge: Coordination and Governance in the 80s. A report on Issues and Directions in Statewide Coordination and Governance of Postsecondary Education in the 1980's. Report No. 134. Education Commission of the States. Denver, Colo.: Colorado Dept. of Postsecondary Education. 1980.

Ford, Marge L.; Stevens, Patricia C., Institutional Research Problems Related to Large Databases at Multicampus Universities, a paper presented at the Annual Meeting of the Mid-America Regional Institutional Research Conference (Kansas City, MO, November 7-8, 1983). p. 3.

Hemminger, Gerd. "Information for Planning." (ed.) Harold L. Wattel, Planning in Higher Education. Hempstead, NY: Hofstra University, 1975, pp. 124-126.

Hendrickson, Robert M.; Bartkovich, Jeffrey P. Organizational Systematics: Toward a Classification Scheme for Postsecondary Institutions. A paper presented at the Annual Meeting of the Association for the Study of Higher Education (ASHE) (Chicago, IL. March 12-14, 1984.

Herzlinger, Regina, "Why Data Systems Fail in Public Organizations," Harvard Business Review, January-February 1977, pp. 81-86.

Hines, Edward R. and Hartmark, Leif S. Politics in Higher Education. Washington, D.C.: American Association for Higher Education, 1980.

Hollander, T. Edward. "Information Related Problems in State Planning." A paper presented at a Seminar for State Leaders in Postsecondary Education (Philadelphia, PA, May 1975) Sponsored by the Education Commission of the States, Denver, Colo., Inservice Education Program: State Higher Education Executive Officers Association. Report No. IEP-905-3, May 1975. pp. 3-4.

Huff, Robert A., "Problems and Issues Related to the Data Game." A paper presented at a Seminar for State Leaders in Postsecondary Education (Philadelphia, PA, May 1975). Sponsored by the Education Commission of the States, Denver, Colo., Inservice Education Program. State Higher Education. Executive Officers Association, 1975. (May), pp. 4-6.

Jones, Dennis P., Data and Information for Executive Decisions in Higher Education. An NCHEMS Executive Overview. National Center for Higher Education Management Systems. Boulder, Colo.: NCHEMS, 1982. pp. 47-48.

Juckiewicz, Robert; Kroculick, Joseph. Distributed Administrative Management Information Systems. In: Information Resources and the Individual. Proceedings of the CAUSE National Conference (San Francisco, CA, December 11-14, 1983). Boulder, Colo.: CAUSE, 1984. pp. 10-13.

Katchain, Anahid. Systems-related Experiences in Eight Pilot-Test States. In: Postsecondary-Education Information Planning at the State Level: Volume 5. Boulder, Colo.: NCHEMS, 1979.

Katz, Daniel and Kahn, Robert L., The Social Psychology of Organizations. New York: John Wiley & Sons, 1978. pp. 397-425.

Kieft, Raymond N. Academic Planning: Four Institutional Case Studies. Boulder, CO: NCHEMS, 1978.

Laurence, G. Ben and Service, Allan L., ed. Quantitative Approaches to Higher Education Management. ERIC/ Higher Education Research Report, No. 4. Washington, DC: American Association for Higher Education, 1977.

McCay, Marilyn. The Utility of AEGIS Finance Data: A Researcher's Perspective. Work paper series. Boulder, Colo. NCHEMS, 1982, p. 4.

McLaughlin, Gerald W., et al., Balancing Computer Resources with Institutional Needs. A paper presented at the Annual Association for Institutional Research Forum (18th Houston, Texas, May 21-25, 1978). pp. 4-6.

McManis, Gerald L., Implementation and Management of Information Systems for Colleges and Universities. Littleton, Colo.: Iceland Corporation, 1978.

Millard, Richard M. "Issues of Statewide Concern in Higher Education," a paper presented at a Seminar for State Leaders in Postsecondary Education (Keystone, Colo., July 1977), sponsored by the Education Commission of the States, 1977.

Millard, Richard M. "Power of State Coordinating Agencies" in Paul Jedemus, Marvin W. Peterson, et al. Improving Academic Management. San Francisco, CA Jossey-Bass, 1981. pp. 65-95.

Miller, Howard J. Academic Program Development Efficiency through Interinstitutional Cooperation. An unpublished thesis written by the author, 1985.

Millet, John D., "Relating to Governance and Leadership." in Paul Jedamus, Marvin W. Peterson, et al., Improving Academic Management. San Francicso, CA. Jossey-Bass, 1981. pp. 495-509.

Rokicki, Phillip S.; and Springer, Peggy. Tying Diverse Students and Administrative Data Bases Together. In: Information Resources and the Individual. Proceedings of the CAUSE National Conference (San Francisco, CA. Dec. 11-14, 1983) Boulder, Colo.: CAUSE, 1984.

Ryland, Jane N., State Reporting Practices and the Quality of HEGIS Finance Data Working Paper Series, Boulder, Colo.: NCHEMS, 1982.

Smith, J. William: Groves, William E., Organizational Restructuring for Better Information Management. In: Information Resources and the Individual. Proceedings of the CAUSE National Conference, (San Francisco, CA, December 11-14, 1983). Boulder, Colo.: CAUSE, 1984.

University of Nevada at Reno. A Management Information Systems Needs Analysis for the University of Nevada-Reno. A Report prepared by the MIS Task Force, 1983.

Wattel, Harold L. (Ed). Planning in Higher Education. Hempstead, New York: Hofstra University Press, 1975.

Wilson, Richard F. Linking Academic Planning to Decision Making. A paper presented at the Annual Forum of the Association for Institutional Research (Houston, May 1978). p. 5.

Wing, Paul, et al., Statewide Measures Inventory. Technical Report 68, Boulder, Colo.: NCHEMS, 1975.